Miltech Simulations MH60

Automatic Flight Control System (AFCS) and Stability Augmentation System (SAS)

Warning
A minimum 2% Extremity Deadzone on Collective (In some cases up to 5% on old or inaccurate hardware) is required for AFCS to function correctly. Not enough deadzone will result in the input controllers and the system inputs conflicting with each other, leading to erratic or unexpected behavior. No deadzone is required on Cyclic, fully supporting unsprung cyclics.

Understanding the Pilot Assistance and Stability Systems

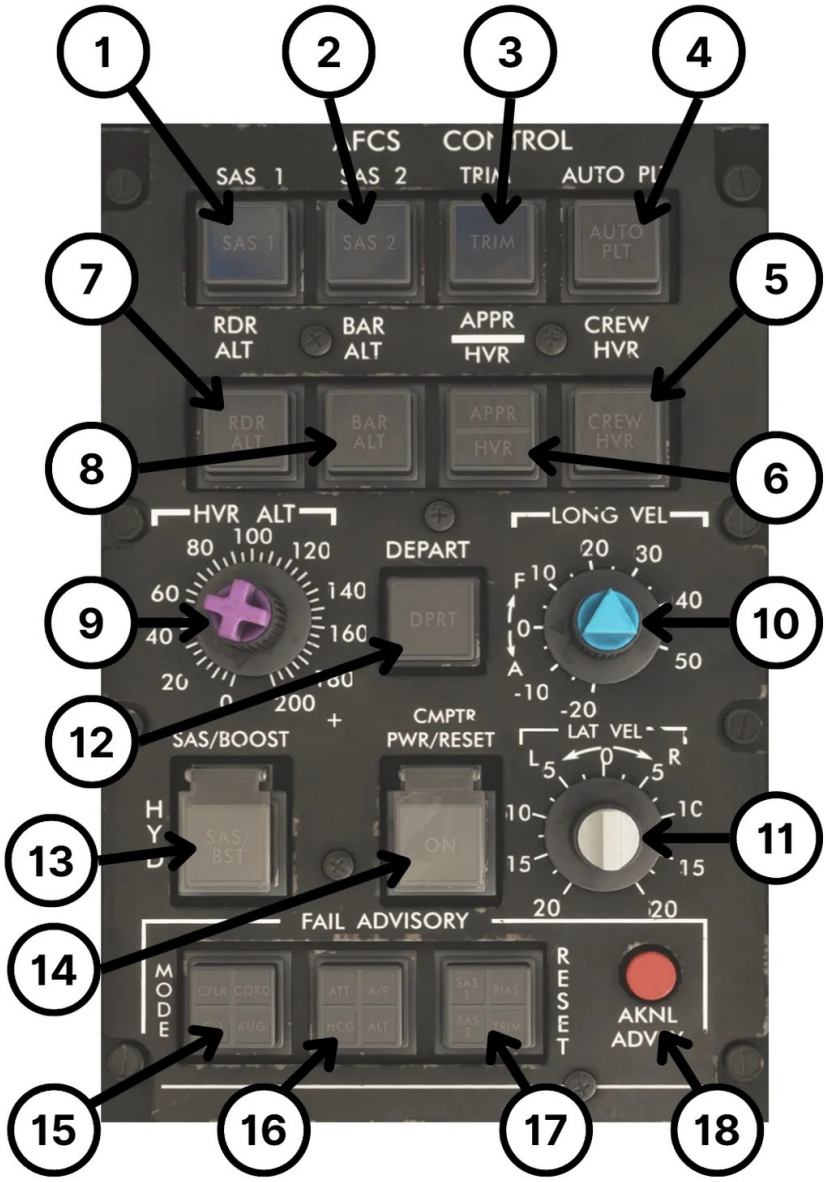
The **Automatic Flight Control System (AFCS)** in the MH60 Series is an integrated system designed to enhance stability, handling, and autopilot functions. It reduces pilot workload by providing both **short-term stability (via SAS)** and **long-term flight path control** (via trim, autopilot, and attitude hold features).

The AFCS in the MH-60 consists of three primary subsystems:

1. **Stability Augmentation System (SAS)** * Provides short-term rate damping to smooth out small, rapid oscillations. * Two independent channels: SAS 1 (FCC 1) and SAS 2 (FCC 2). * Deactivation of one, or both of the SAS Computers is considered an emergency, and requires immediate landing. The aircraft becomes really difficult to maneuver when SAS is off.
2. **Force Trim System** * Provides long-term stability and flight path control. Enables force trim, allowing the pilot to "set and hold" control positions.
3. **Autopilot (AFCS) Coupler** * Provides automated flight modes such as:

- **Attitude Hold** (Pitch/Roll/Yaw)
- **Altitude Hold** (Baro/Rad)
- **Hover Hold** (Pilot/Crew)
- **Departure Mode** (also known as Go-Around mode)

AFCS/SAS Panel



AFCS/SAS Panel

Note
More information on Stability Augmentation System: Stability Augmentation System (SAS)
More information on Autopilot Modes: AFCS Coupler (Helicopter Autopilot)

1. **SAS 1:** Toggles Stability Augmentation System computer 1. Always engaged in normal flight, deactivation may lead to reduced stability and increased pilot workload.
2. **SAS 2:** Toggles Stability Augmentation System computer 2. Always engaged in normal flight, deactivation may lead to reduced stability and increased pilot workload.
3. **TRIM:** Disables automatic and manual Force Trim functions. For more information, refer to Force Trim System
4. **AUTO PILOT:** Autopilot Master. Required for any other Autopilot mode to engage. Additionally, this mode provides attitude hold/speed hold, depending on airspeed.

5. **CREW HOVER:** Transfers Hover Control to "Crew Control", generally used for SAR operations. This mode only engages if APPROACH/HOVER is engaged. Please refer toAFCS Coupler (Helicopter Autopilot) for more information.
6. **APPROACH/HOVER:** The aircraft will automatically enter the "approximation and hover mode". Aircraft speed (longitudinal and lateral) and altitude will be dictated by the HVR ALT/LONG VEL/LAT VEL knobs.
7. **RADAR ALTITUDE HOLD:** This mode automatically controls the collective to hold a constant altitude above the terrain using the radio altimeter. RADAR ALT will not engage if AGL is higher than 5000ft.
8. **BARO ALTITUDE HOLD:** This mode automatically controls the collective to hold a constant altitude using the barometric altimeter.
9. ◉ **HOVER ALTITUDE KNOB:** Selects hover altitude above ground, in Feet, when APPR/HVR mode is engaged.
10. ◉ **LONGITUDINAL VELOCITY KNOB:** Selects longitudinal (forward) speed, in knots, when APPR/HVR mode is engaged.
11. ◉ **LATERAL VELOCITY KNOB:** Selects lateral speed, in knots, when APPR/HVR mode is engaged.
12. **DEPART MODE:** This mode, also referred to as "Go-around" mode, will quickly and automatically take the aircraft from a coupled hover to cruise flight (Altitude of at least 200ft above ground, and speed of 120 knots). This mode can only be engaged if the aircraft is flying at an indicated airspeed of 50 knots or under.
13. **SAS HYD BOOST:** INOP
14. **CMPTR PWR/RESET:** INOP
15. **FAIL ADVISORY RESET 1:** INOP
16. **FAIL ADVISORY RESET 2:** INOP
17. **FAIL ADVISORY RESET 3:** INOP
18. **ACKNOWLEDGE ADVISORY:** INOP

Stability Augmentation System (SAS)

> Caution
> You generally do not want to deactivate SAS at any circumstance, as this may lead to reduced stability and increased pilot workload. It is generally considered an emergency, and requires immediate landing.

The SAS System consists primarily of two channels (SAS1 and SAS2), controlled by two separate Flight Control Computers for redundancy. SAS primarily provides **rate damping** to counteract small, rapid oscillations (especially in pitch, roll, and yaw). This helps stabilize the aircraft and reduces pilot workload.

Many people compare SAS to Fly By Wire on an aircraft - though both are similar in many ways, FBW is typically designed to keep the aircraft's attitude when no pilot input is detected. SAS does not keep attitude stable; it only functions as a system that actively counteracts reactions from helicopter oscillations.

The SAS System is generally always enabled, both when starting Cold and Dark, or starting from the Runway.

AFCS Coupler (Helicopter Autopilot)

Warning
A minimum 2% Extremity Deadzone on Collective (In some cases up to 5% on old or inaccurate hardware) is required for AFCS to function correctly. Not enough deadzone will result in the input controllers and the system inputs conflicting with each other, leading to erratic or unexpected behavior. No deadzone is required on Cyclic, fully supporting unsprung cyclics.

Caution
In general, all modes require BOTH SAS 1 AND SAS 2 computers to be enabled. None of these modes will enable if the aircraft is on the ground, or SAS has failed/deactivated.
Altitude Modes rely on a fast refresh rate, which is directly tied to the FPS. Frame Rates under 20 FPS may result in severe oscillations in altitude. Make sure Glass Cockpit Refresh Rate is set to Medium or High on your MSFS Settings.

Note
MH60 is not equipped with Heading Select or LNAV modes, as per the real aircraft.
If Significant Cyclic Input is detected (greater than 20% on any direction), **Hover and Crew Hover** modes will automatically disconnect. On Springless systems, it is recommended to return your cyclic as close to neutral as possible.

Miltech Simulations MH60 features a complex Autopilot system, with several modes modeled.

1. **AUTO PILOT:** Autopilot Master Switch. This switch must be depressed for other modes to engage. Additionally, it functions as a basic attitude hold/speed hold Autopilot Mode.
2. At airspeeds **under 50 knots**, this switch only functions as Autopilot Master switch, to combine with Altitude modes. Force Trim system remains in effect.
3. At airspeeds **over 50 knots**, enabling this mode will automatically hold the aircraft's airspeed at the time of engagement. Aircraft manages the attitude automatically to achieve leveled flight at this speed. Additionally, functions as Autopilot Master switch, to combine with Altitude modes.
4. If the 50-knot threshold is crossed at any time, the mode will automatically switch modes.
5. To change speed, first disengage this mode, adjust speed, and then reengage.
6. To change heading, perform a turn with cyclic and/or pedals.
7. A temporary ATT disconnect is available. SET AUTOPILOT DISENGAGE (on any Force Trim Mode). Press+Hold, Input Repetition must be ON (FS24)
8. This mode does not control the aircraft's altitude - it can be coupled along with either ALT mode.
9. INCREASE ROTOR LONGITUDINAL TRIM and DECREASE ROTOR LONGITUDINAL TRIM will increase/decrease target speed by 6 Kias on this mode.
10. **RADAR ALT:** This mode automatically controls the collective to maintain a constant altitude above the terrain using the radio altimeter.
11. RADAR ALT will not engage if the altitude above ground (AGL) is higher than 5000ft.
12. This system will maintain the altitude above ground at the time of engagement.
13. To change altitude, disengage the system, manually fly to the desired altitude and then reengage.
14. Beware that Radio ALT Hold has a high sampling rate, and as such the system may perform aggressive corrections on unstable terrain. The aircraft will also react to ground obstacles, such as buildings and

vegetation, as these are detected by the radio altimeter.

15. After engaging this mode, reduce the collective to 0% and ensure a sufficient extremity deadzone is set. Not doing so may cause control conflicts with the system.
16. INCREASE ROTOR LONGITUDINAL TRIM and DECREASE ROTOR LONGITUDINAL TRIM will increase/decrease target speed by 6 Kias on this mode.
17. **BARO ALT:** This mode automatically controls the collective to maintain a constant barometric altitude.
18. This system will maintain the barometric altitude at the time of engagement.
19. To change altitude, disengage the system, manually fly to the desired altitude and then reengage.
20. After engaging this mode, reduce the collective to 0% and ensure a sufficient extremity deadzone is set. Not doing so may cause control conflicts with the system.
21. INCREASE ROTOR LONGITUDINAL TRIM and DECREASE ROTOR LONGITUDINAL TRIM will increase/decrease target speed by 6 Kias on this mode.
22. **APP/HOVER:** The aircraft will automatically enter the "approximation and hover mode". Aircraft speed (longitudinal and lateral) and altitude will be dictated by the three knobs on the AFCS Panel.
23. If airspeed is above 50 knots, and/or altitude is above 250ft, aircraft will quickly and safely decelerate and descend to 50 knots and 200 feet above ground ("Approach" Regime). The APPR light will be displayed on the APP/HVR button.
24. Under 50 knots/250ft, the aircraft enters "Hover" regime, in which the altitude, lateral, and logitudinal ground speeds are dictated by the three knobs on the AFCS Panel.
25. Aircraft will automatically manage pitch to control longitudinal speed, targeting the selected speed on the LONG VELOCITY knob (from -20 Knots Ground Speed (KGS) to +50 KGS)
26. Aircraft will automatically manage roll to control lateral speed, targeting the selected speed on the LAT VELOCITY knob (from -20 KGS to +20 KGS)
27. Aircraft will automatically manage collective, targeting the altitude (as measured by the radar altimeter) selected on the HVR ALT knob.
28. The pilot will continue to have full pedal control to modify the heading.
29. After engaging this mode, reduce the collective to 0% and ensure a sufficient extremity deadzone is set. Not doing so may cause control conflicts with the system.
30. **CREW HOVER:** Upon engaging, Hover Controlled is transferred to "Crew Control", generally used for SAR operations. The user can now move the aircraft from the cabin by using keybinds.
31. This mode can only be engaged if the aircraft's APP/HOVER is engaged, and aircraft is on HVR Regime.
32. Use keybinds: INCREASE AUTOPILOT REFERENCE AIRSPEED and DECREASE AUTOPILOT REFERENCE AIRSPEED to increase/decrease longitudinal velocity by plus/minus 1 knot Ground Speed on each keypress; up to +/- 5 knots.
33. Use keybinds: INCREASE AUTOPILOT REFERENCE MACH and DECREASE AUTOPILOT REFERENCE MACH to increase/decrease lateral velocity by plus/minus 1 knot Ground Speed on each keypress; up to +/- 5 knots.
34. Speed Knobs in the cockpit are deactivated in this mode. Ground speed is capped at 5 knots in any direction.
35. Hover Altitude continues to be controlled by the HVR ALT knob. Heading Control remains on the pilot pedals.

36. After engaging this mode, reduce the collective to 0% and ensure a sufficient extremity deadzone is set. Not doing so may cause control conflicts with the system.
37. **DEPARTURE:** This mode, also referred to as "Go-around" mode, will quickly and safely take the aircraft from a coupled hover to cruise flight.
38. If aircraft's RDR Altitude is under 150 feet, the collective will take over controls, increase the altitude to 150 feet AGL, and keep a RDR Alt Hold.
39. If aircraft's RDR Altitude is above 150 feet, the aircraft will keep a RDR Alt Hold (or BARO, if above 5000ft) at the altitude at the time of engaging.
40. Aircraft will automatically manage pitch to control longitudinal speed, targeting a speed of 120 knots. If speed is greater than 120 Knots at the time of engaging, the aircraft will decelerate to 120 knots.
41. Roll and Yaw/Heading are fully controlled by the pilot.

Keybinds

All keybinds available for AFCS, SAS and Coupler systems can be found on the Keybinds Guide